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ABSTRACT

This paper reports on initial efforts to develop and test a model which will account for the formation of communication structure in large organizations. Communication structure may be defined as those metric variables obtained from the quantitative analysis of communication network data. Communication networks may be defined as the patterns of human-to-human contacts through which information flows in an organization. Laboratory and field studies have shown several factors to be related to communication structure. Their findings provide the basis for a model which is formalized into a set of propositions and mathematized as a set of recursive simultaneous equations, that is, a path analytic model. Findings are reported from a field study in which network and other date were gathered from naval personnel in a large midwest training facility (n=480). The structural data are analyzed in conjunction with the other data to test the "goodness of fit" of the theoretical model with empirical reality. While the data do not permit substantive conclusions regarding the determinants of communication structure, the paper concludes with suggestions for revision of the model and further analysis. (Author/RB)

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A PRELIMINARY CAUSAL MODEL OF THE FORMATION OF COMMUNICATION STRUCTURE IN LARGE ORGANIZATIONS*

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ABSTRACT

A CAUSAL MODEL OF THE FORMATION OF COMMUNICATION STRUCTURE IN LARGE ORGANIZATIONS

Communication structure may be defined as those metric variables obtained from the quantitative analysis of communication network data. Communication networks may be defined as the patterns of human-to-human contacts through which information flows in an organization. During the past decade researchers have made considerable progress in measuring and analyzing both networks and structure. To date, however, little is known regarding the causal determinants of either. This paper reports initial efforts to develop and test a model which will account for the formation of communication structure in large organizations.

Laboratory and field studies have shown several factors to be related to communication structure. Their findings provide the basis for a model which is formalized into a set of propositions and mathematized as a set of recursive simultaneous equations, i.e., a path analytic model.

Findings are reported from a field study in which network and other data were gathered from naval personnel in a large midwest training facility (N = 480). The structural data are analyzed in conjunction with the other data to test the "goodness of fit" of the theoretical model with empirical reality. While the data do not permit substantive conclusions regarding the determinants of communication structure, the paper concludes with suggestions for revision of the model and further analysis.

INTRODUCTION*

A communication "network" may be defined as a relatively stable configuration of human to human contacts through which information flows in an organization. Communication "structure," on the other hand, refers to metrics which quantify communication networks. Thus "network" signifies topological properties and role classifications, while "structure" refers to the measurement of various properties of the network.

Research has revealed several important facts about communication networks, some of which constitute significant departures from classical views on this matter. First, it has been shown that actual communication networks in organizations differ markedly from those specified by organizational charts, and that the power network within an organization parallels the former rather than the latter (Thompson, 1956; and others). Secondly, it has been found that a given organization may have distinctly different networks for different communication purposes (work-related, informal or social, rumor, etc.: Berkowitz and Bennis, 1961; Davis, 1968; Marting, 1969; Walton, 1963; Whitley and Frost, 1972).

Knowledge of the actual networks in organizations can be tremendously valuable theoretically since it may allow both the understanding of current processes of the organization and the prediction of its future processes. In addition, it has obvious practical application for a manager who, for example, wishes either to get a particular task accomplished as efficiently

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as possible or to disseminate a particular type of information throughout his organization.

Research within this important field of inquiry has followed basically two courses: (1) small group experiments using imposed communication networks; or (2) large organizational field studies. In the past, each of these approaches has proved partially inadequate to the theoretical challenges posed by communication networks in large organizations in ways to be discussed below.

The majority of studies involving communication networks have been performed on small groups (of four to seven members) within carefully restricted experimental settings. These studies, beginning with the early work of Bavelas (1950) and Leavitt (1951), have sought to determine the effect of communication networks on such variables as speed, accuracy of performance, task satisfaction, and morale. Despite the frequent lament that the findings to date of imposed network studies have been largely inconsistent and contradictory (Collins and Raven, 1969; Glanzer and Glaser, 1961), there is still a tendency to generalize small group findings to large organizational phenomena. Although some of the techniques employed by small group researchers in measuring structure may be applicable to large organizations, it seems doubtful that the same is true of their findings.

The first limitation to their generality is that small group findings seem dependent to a great extent upon group size. Weick (1969), for instance, reported that when group size is increased from three to twelve persons (1) differences in participation rates become exaggerated, (2) the need for a leader increases, (3) the group is more likely to break into subgroups, (4) it is more difficult for each person to communicate with everyone else, and (5) everyone has less time to talk. Rome and Rome (1961) further noted that the Completely-Connected (COMCON) variety of network may not exist in larger groups since the increase in size may preclude the possibility of each member's entering into two-way relationships with all other members. This raises doubts as to whether <u>any</u> of the network patterns studied in the small group literature (i.e., wheel, circle, chain, etc.) actually occur in their pure form in large organizations. And certainly if

the network patterns themselves do not exist in large organizations, findings based upon them would not seem generalizable to this larger domain.

Another question is that of the relative impact an individual has within a small group compared to his impact in a large organization. If it differs across these two situations, findings on, for example, leadership emergence which resulted from small group research would seem of limited utility in organizational literature.

Then there is the problem of the types of groups studied. While most small group researchers employ ephemeral, ad hoc groups, large organizations are generally composed of long term work groups. This fact has two serious implications. First, Lorge, et al. (1958) suggest that short term groups behave differently from long term groups. Secondly, Burgess (1969) found that differences in task performance among two different network types (wheel and circle) disappeared by the 500th trial. Thus, even if network structures of the small group variety originally did exist in large organizations, such differences would seem unlikely to persist due to the lengthy time span of an on-going organization.

Another difficulty is the disparity between tasks used in small group studies and those found in large organizations. Small group tasks are generally much less complex and meaningful than the jobs performed within large organizations.

Finally, differences in performance have been noted (Cohen, Robinson, and Edwards, 1969) between small groups in isolation (such as those in most network studies) and those embedded within an organizational context.

Still, although the results of small group network studies cannot be generalized with confidence to large organizations, the metrics used in such studies for quantifying communication structure are highly applicable and useful.

Let us now consider the contributions and shortcomings of the organizational field studies. The communication variables most frequently examined in these studies have been: message content (informative, instructive, problem-related, social, etc.) (Berkowitz and Bennis, 1961; Dubin, 1961;

Walton, 1963; Weiss, 1956; Wickesberg, 1968); communication channel or mode (face-to-face, written, telephone) (Conrath, 1972; Dewhirst, 1971; Melcher and Beller, 1967; Thomason, 1966); destination (to people within the organization vs. outside) (Dewhirst, 1971; Wade, 1968); direction of communication flow [horizontal (to peers), vertical (to subordinates or superiors), diagonal (to those both at a different hierarchical level and in a different department than the respondent)] (Simpson, 1959; Wickesberg, 1968); initiation (e.g., people of higher rank more frequently initiate communication with those of lower rank than vice versa (Dubin, 1961; Thomason, 1966; Wickesberg, 1968); feedback (in superior-subordinate relationships) (Cook, 1968; Dewhirst, 1971); and openness (in superior-subordinate relationships) (Burke and Wilcox, 1969; Dewhirst, 1971).

Two major problems may be found in most large organization studies. First, compared with small group studies, they are operationally and methodologically less sophisticated. In the majority of the organizational studies encountered in our review, structural metrics were rarely used; typically raw data were correlated with raw data or else converted to percentages prior to comparison. Second, most of the large organization field studies are atheoretic. For example, some have been done merely to ascertain communication bottlenecks or procedural problems so as to improve employee morale and efficiency; others have merely checked for correlations among communication variables (e.g., number of telephone calls received correlated with number of telephone calls initiated) or between communication variables and other types of variables (e.g., rate of communication initiation correlated with rank). Thus, while they do tell us <u>what</u> relations exist in a particular organization at a particular point in time, they do not tell us <u>why</u> they occur. Furthermore, there is the question of the generality of their findings across time and to other organizations. Finally, none of them clarify the role of structure as an antecedent variable and as a consequent variable.

Given these problems with earlier research, this study attempts to apply structural metrics to a large organization and to examine the antecedent conditions for structure by developing a causal path model. This

is done in the hopes of contributing to the development of a theoretical explanation of the emergence of networks in large organizations.

Job Dimensions

According to Dubin (1961), a job consists of a bundle of tasks. Each job is a mixture of flexibility and stability. A particular job is stable to the extent that it is composed of tasks which must be performed in a predetermined fashion irrespective of the job occupant's desires. A particular job is flexible to the degree that it allows variation in approach or emphasis or even total omission of particular tasks. Though classical theory assumes that people with identical job titles will perform their tasks in the same way, experience indicates that they will perform certain aspects of their jobs differently. In fact, from time to time a given job may be performed differently by the same person. Bakke (1950) stated that a given individual's function within an organization "can be described in terms of work process, method, place, time, energy, and product requirements." It is this vast array of characteristics which we must attempt to encompass in analyzing job dimensions.

In the past, small group network researchers have acknowledged task to be a critical determinant of performance across the various types of networks. Centralized networks, for instance, were found to be more efficient than decentralized networks with simple tasks, while the reverse was true when more complex tasks were used (Shaw, 1971). Subsequent to this finding, several typologies emerged (see Shaw, 1971) which provided us with a couple of the ideas we later employed in our own operationalization. For the most part, however, the vast differences between real life and laboratory tasks (greater duration, more variation, greater flexibility) precluded the possibility of deriving too much of use from the small group research. A brief review of prior conceptualizations of tasks in organizational studies provided additional possible dimensions such as "instructing," "informing," "formulating policy," "implementing policy," etc. (Weiss, 1956; Marples, 1968; Sadler and Barry, 1967; Thomason, 1966).

Seeing that task has not as yet been conclusively operationalized,

we attempted our own conceptualization of it, postulating three dimensions: substances, activities, and qualities, contingent upon final determination via a factor analysis. "Substances" are what people work with in their jobs. These may be people, objects, or data. "Activities" are the types of operations people perform upon the substances of their jobs. These are such things as receiving, distributing, etc. And finally, "qualities" are characteristics of the job such as importance, flexibility, enjoyability, etc. On the basis of these three a priori dimensions, items were generated for the questionnaire; and the subsequent factor analysis of them which produced four dimensions: "substances" factored as three dimensions (people, objects and data), and "qualities" factored as the fourth. The analysis produced no "activities" dimension. [For a specification of the factor analysis, see Methods section.]

We postulated that job exercises both a direct and an indirect influence upon communication within large organizations. It exercises a direct influence inasmuch as it dictates communication with people whose contact is necessary for the completion of the job. It influences communication indirectly through the proximity variable in that people with similar jobs often office in the same building. Job also influences communication through the interpersonal and commitment variables.

Interpersonal Attraction

For the purposes of this study we defined attraction as: the predisposition for approach-avoidance behavior. By including the possibility of avoidance behavior, we have allowed for negative as well as positive values on this variable, negative values of interpersonal attraction obviously signifying dislike.

Attraction between two people may be based upon any of innumerable dimensions each of which may be more or less salient to one person than it is to the next. Still, with all this possible variation, the relationship between this variable and the others in our model is undeniable. In a recent review of the group structure literature, in fact, Collins and Raven (1969) stated that "causal relationships between interpersonal attraction and

communication are probably the best established propositions in social psychology."

Attraction also correlates highly with proximity according to several studies cited by Berscheid and Walster (1969). These authors relate one study in which each coed was given a contrived vita of another coed, being told that she and the other coed either would or would not be working together on a laboratory task. The investigators in this study found that Ss tended to rate the coed whose folder they had read more highly on an interpersonal attraction scale when they anticipated working with her than when they did not.

Conversely, the various balance theories seem to predict that, other things being equal, people will seek proximity to people they like rather than to those they do not like. Of course, due to the influence of task upon whom a person must contact, the influence of personal attraction upon proximity was hypothesized to be considerably weaker than the reverse relationship discussed in the preceding paragraph.

Commitment

There are two ways in which commitment has been conceptualized in organizational studies. One concerns an individual's potential behavior and is expressed in terms of an individual's willingness to leave the organization (e.g., Hrebiniak and Alutto, 1972; Porter and Steers, 1973). The other involves the degree to which the individual's and the organization's ideologies overlap, and is usually operationalized in terms of the degree to which the individual identifies with the organization's goals and/or values (Brager, 1969; Hall, Schneider and Nygren, 1970; Sheldon, 1971). One advantage of measuring commitment in terms of ideological agreement is that it permits the use of tenure as a separate variable. When willingness to leave is used instead, tenure may be only a dimension of commitment. Regardless of the operationalization selected, most studies find a correlation between job qualities and commitment which is not overly strong, but which is sufficiently strong to warrant the prediction of a positive relationship between the personally rewarding characteristics of an individual's job and his

unwillingness to leave the organization.

Proximity

Proximity has frequently been identified as an important influence on communication. For example, Harold Guetzkow's (1965) review of organizational communication literature cites numerous studies (e.g., Blau, et al., 1956; Caplow and Forman, 1950; Miller, 1951; Zipf, 1946) which document a positive relationship between proximity and amount of communication. Our review of the literature indicated that the relationship between proximity and communication is mediated by interpersonal attraction (cf. Berscheid and Walster, 1969; Collins and Raven, 1969). Berscheid and Walster suggest that proximity functions primarily as an intensifier of affect by increasing the probability of one person's obtaining emotionally salient information about the other person. Hence, besides strong liking and an increase in communication, proximity can lead to a strong disliking and (presumably) to a decrease in communication. Berscheid and Walster predict, however, that (along the lines of Newcomb's co-orientation theory, 1953) proximate relationships will more often lead to liking than to disliking since people, being dependent upon those near them for various types of support and reward, will be more apt to act in ways which encourage reward from those nearby. Moreover, that liking will be the more frequent outcome of proximity could be expected from the "reciprocity of liking" rule which suggests that individuals will more often be attracted than unattracted to those who express liking for them.

While most of the studies testing the relationship between proximity and communication have been concerned with social rather than task communication, within large organizations the tasks required by one's job may dictate a person's contacts to such a degree that his initial proximity is considerably less influential upon choice of contacts than it would be if these were social choices. That is, task will influence proximity by dictating contacts which may differ appreciably from those which would have resulted if initial proximity had operated independently of task.

Therefore, in view of the influence exerted by job upon proximity

and the mediating role of interpersonal attraction in the relationship of proximity to communication, we hypothesized that the more an individual's job requires working with people or with information, the greater will be his proximity to others, and the more it requires working with objects, the less his proximity. We also hypothesized an increase in proximity will lead to an increase in interpersonal attraction.

Since proximity is neither a necessary nor sufficient condition in any of these relationships, it seemed more appropriate to conceptualize it as an opportunity for communication. This conceptualization is compatible with Hall's (1966) tri-partite division of human space into informal space (limited by the extent of one's auditory/visual capacities); fixed-featured space (defined by such permanent boundaries as walls); and semi-fixed-featured space (configured by large, but movable, objects such as furniture). Each of these constitutes limitations to face-to-face communication. Hence we have viewed proximity as the degree of opportunity for face-to-face communication.

The operationalization of proximity constituted quite a challenge in the present study. Most proximity studies have involved small numbers of individuals and their behavior in personal space and in semi-fixed-featured space. Those which have dealt with the larger domains defined as fixed-featured-space (Festinger, Schachter and Back, 1963; Yarosz and Bradley, 1963), have been locale-specific, requiring a description of the particular physical layout. We chose to design a more generally applicable operationalization of proximity.

Network Metrics: Communication Structure

Indik (1968) proposed that organizations could be studied from basically four levels: individual, group, system, and environment. The level we have chosen to examine is that of the individual.

As previously mentioned, several important metrics have been used in small group research to quantify communication structure. Four such metrics are: dominance, centrality, connectedness and integrativeness.

Though all four of these can be calculated for either individuals or groups, consistent with our chosen level of analysis we are interested here in only the versions of them which apply to the behavior of individuals. Dominance refers to the degree to which the distribution of amount of communication among individuals within a group departs from rectangularity. Hence it is a measure of the degree to which individuals participate equally in the communication network of which they are members. Centrality, in contrast, refers to the number of steps a particular individual is from all other individuals within his group. This metric takes into account indirect linkages (two people being linked indirectly by virtue of their contact with a third person). Hence, the smaller the distance (in terms of number of links) between a given respondent and all others within his group, the greater his centrality in that group. Connectedness is calculated as the number of links a person actually has with those in his group divided by the total possible number of links he might have within that group. And finally, integrativeness indexes the degree to which the people to whom the respondent is linked are linked to each other.

The structure variable we chose to examine here is integrativeness. This is because, while the other metrics tend to ignore non-group members, this metric provides a value for every respondent in the population.

The Model

The foregoing discussion can be formalized into a causal path model which will permit the testing of the propositions specified among the variables. The model indicates the direct and indirect relationships which should occur in the data for the measured variables. By implication, of course, it also specifies those relations which are expected not to occur, i.e., those pairs of variables among which zero order or partial correlations should approximate zero. As indicated in Figure 1, the three job substance dimensions of objects, information, and people are taken as causes of proximity, with the first relation viewed as negative. Commitment is wholly determined by the fourth job dimension, quality. Like commitment, interpersonal attraction is also directly dependent upon one antecedent

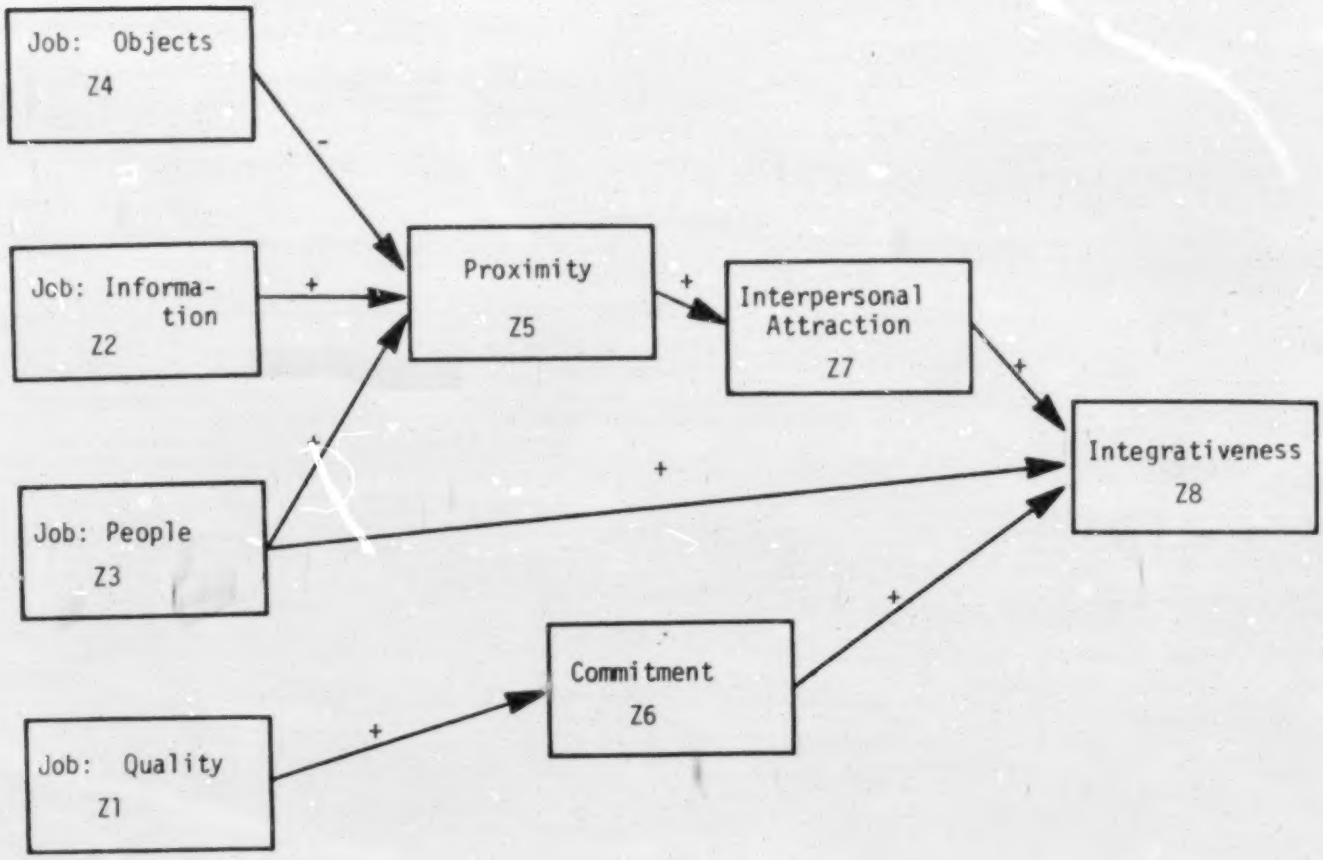

Figure 1.

A preliminary causal path model among eight variables

variable, proximity. Finally, the structural variable of integrativeness is taken to be directly dependent upon interpersonal attraction, the job dimension of "people," and commitment.

The set of equations representing this model are:

$$Z_1 = e_1$$
$$Z_2 = e_2$$
$$Z_3 = e_3$$
$$Z_4 = e_4$$
$$Z_5 = p_{51.23} Z_1 + p_{52.13} Z_2 + p_{53.12} Z_3 + e_5$$
$$Z_6 = p_{64} Z_4 + e_6$$
$$Z_7 = p_{75} Z_5 + e_7$$
$$Z_8 = p_{87.36} Z_7 + p_{86.37} Z_6 + p_{83.76} Z_3 + e_8$$

where $Z_{1...8}$ are the standardized scores for the eight variables, p represents the path coefficients, and e represents the error term associated with each equation.

METHOD

Sample

The data were collected in March, 1974, at a naval training center in Illinois. Out of 480 respondents, 458 questionnaires were usable, constituting a 95 percent response rate. Data collection encompassed all staff and enlisted personnel but none of the recruits being trained. As might be expected in a sample obtained from this type of military installation, almost all the respondents were male.

Measurement

In order to obtain information pertinent to the job dimensions,

respondents were asked to complete the Job Dimensions Profile (JDP). This instrument, developed by the authors, consists of seventy-two Likert-type scale items. The respondent indicates the extent to which each item pertains to his job. The scales run from zero to nine, being composed of ten intervals anchored only at the extremities. Since this instrument is still under development and needs validation, respondents also completed the well-known Job Dimensions Index (JDI).

Data on proximity were gathered by having each respondent examine a map of the one mile square experimental location and indicate the areas in which he spends his time. Specifically, the respondent indicated the number of hours spent during the week (to the nearest hour) in each of thirty-six buildings, "out-of-doors," or "elsewhere." To ensure a common time frame, the work week was defined as 0700 to 1700, Monday through Friday; this yielded a fifty-hour work week which could be apportioned over the various locations on the base.

The commitment variable was operationalized as the responses to four seven-interval Likert-type scales indicating the extent to which respondents were committed to their jobs, the base, Navy life, and the military in general. Data in this report, however, are based solely on the item indexing commitment to the Navy.

As indicated in the earlier discussion, integrativeness is a structural metric applied to network data. Work communication networks were measured by having each person indicate the amount of time in hours and minutes that he spent talking with all other naval base personnel during a typical work week. Each respondent was also instructed to indicate the importance of each contact to the completion of the respondent's job. For this purpose a ten-interval Likert-type scale was used which was anchored at the extremities by the words "extremely important" and "not at all important."

The interpersonal attraction data were obtained through the use of a seven-point, Likert-type scale by having each respondent indicate his amount of liking for every person with whom he communicated. Each point on the scale was verbally anchored; a neutral point was provided at the

midpoint of the scale.

Questionnaires were administered to all personnel in groups of approximately fifty, over a three-day period. A few who were unavailable during that time completed their questionnaires subsequent to the formal sessions; these are also included in the analysis.

Analytic Procedures

In order to obtain the dimensions of job it was necessary to submit the data from the Job Dimensions Profile to a factor analysis. Data were initially analyzed using the Statistical Package for the Social Sciences (SPSS) PA2 routine. This consists of a principal factor solution with iterations followed by a vari-max rotation of the factor matrix.

Proximity data were analyzed by means of a computer program entitled PROXVAL* which was developed to generate a mean joint probability value for each person. Data for the amount of time spent in each location were converted to relative frequencies (i.e., probabilities). The product of the independent probabilities for each pair of individuals was calculated, yielding a joint probability for each person's being proximate to every other person. A person's mean joint probability was obtained by summing each of his joint probabilities and dividing by the number of them. The values thus generated could range from 1.00 (which could only occur if a respondent spent his total time within the same location as all other respondents) to 0.00 (which could occur only if an individual never spent time in the same location as any other person). Thus defined, a person's mean proximity value is sensitive to both the number of persons in any location and the amount of time he spends there.

Interpersonal attraction data for each respondent were averaged across all people whom that person listed as communication contacts. The

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*PROXVAL was written specifically for this study by Kenneth K. Kirste. It was written in JOVIAL for compilation and execution on a CDC 3800 computer. Inquiries regarding the program may be addressed to him.

commitment data utilized in this study were not submitted to any manipulation; raw scores on the single item measuring commitment to the Navy are utilized.

Integrativeness scores were obtained by submitting the network data to analysis by a computer program developed by Richards (1974) entitled Negopy (Version 3.2). The computer generated a single value for each person which ranges from 1.000 to 0.000 and which indicates the extent to which the people a person talks with also talk with each other.

In order to test the path analytic model, data generated by the above procedures were converted to z-scores and analyzed using the SPSS multiple regression program. Three separate analyses were necessary to generate the appropriate path coefficients, one run for each dependent variable having more than one variable antecedent to it. The fourth dependent variable (commitment) was dependent upon only one other variable and hence was analyzable by simple regression.

RESULTS

Factor Analysis

On the initial run of the factor analysis eleven iterations generated seven factors above the criterion eigenvalue of 1.00. These seven factors accounted for 82 percent of the variance. Unfortunately, however, the squared multiple correlations could not be calculated and the initial estimate of communalities utilized by the program were the maximal off-diagonal elements of the correlation matrix. This resulted in the determinant of the matrix exceeding the default value (10^{-8}) and the factor score coefficients being indeterminate.

To solve this problem the factor analysis was rerun using 1.00 as the value for the diagonal elements of the correlation matrix. This required that a non-iterative solution be utilized (SPSS program PA1). Also, by inspection of the earlier output, the default eigenvalue criterion was raised to 1.5. Seven factors were generated which accounted for 45 percent

of the variance. Because the first four of these factors accounted for most of the variance, and because they corresponded most closely with our conceptualization of the job dimensions, our analysis is limited to them. Collectively, they account for 37 percent of the variance (70 percent in the iterative solution).

The items with factor analysis loadings above the .50 level for each of the four factors from the varimax rotation are listed in Table 1.

FACTOR I	FACTOR II	FACTOR III	FACTOR IV
sorting/retrieving info. (.65)	instructing/informing (.74)	enjoyable (.82)	repairing (.78)
cataloging/sorting (.64)	oral (.71)	interesting (.79)	implements/instruments/tools (.75)
numbers (.59)	recruits (.70)	personally rewarding (.76)	machinery (.64)
books/articles/manuals (.56)	classes/students (.69)	prestigious (.61)	chemicals (.53)
printouts (.56)	advising/counseling (.55)	important (.58)	
synthesizing/coord. info. (.56)		flexible (.54)	
writing (.54)		good promotion opportunities (.53)	
disseminating/reporting info. (.53)		self-determined (.52)	
reading (.51)			
computing/analyzing (.50)			

Table 1

Items with factor loadings above .50 for four factors of the Job Dimensions Profile

We identified Factor I as an information dimension since the items which clustered on this factor concerned data (numbers, books, printouts, etc.), its receipt (reading, retrieving), its handling (sorting, computing, analyzing), and its dissemination (reporting, writing). Factor II clearly involved face-to-face contact with people (classes/students, instructing, advising, counseling), and was consequently identified as the people dimension of job. The third factor (Factor III) consisted of qualities which describe the rewards of the job to the individual (enjoyable, important, prestigious, interesting). Factor IV appeared to involve objects which the individual might encounter as a function of his job (machinery, chemicals, repairing). Essentially, Factors I, II, and IV corresponded to the three elements we had expected would form a single "substance" dimension. "Substance" referred to elements with which an individual worked as an intrinsic part of his task, and was composed of the subgroups: people, objects and information. Factor III corresponded to the dimension we had labelled qualities. The dimension of job we had anticipated but which was not yielded by the analysis we had termed "activities." It appears now as if activities are too closely integrated with the particular substances of a job to emerge separately in a factor analysis.

A composite index score for each person on each factor was then created by utilizing the factor-score coefficients matrix. Raw scores on each of the seventy-two variables were converted to z-scores and a scale score for each person on each factor was generated by using the least squares regression method and the factor score coefficients.

Path Analysis

The correlation matrix among the eight variables in the final model is shown in Table Two. Two facts are immediately apparent. First, all of the zero order correlations among the four job dimension variables are zero. This is as it should be since these four variables are derived from a factor analysis which utilized an orthogonal rotation scheme. Second, with only three exceptions, all of the remaining correlations are extremely low and for the most part, approach zero. The exceptions are the correlations

between proximity and the three job dimensions of information (-.13), quality (-.13) and people (.26).

	Z_1	Z_2	Z_3	Z_4	Z_5	Z_6	Z_7	Z_8
Z_1	1.00	.00	.00	.00	- .14	.02	- .08	.09
Z_2		1.00	.00	.00	.26	.01	.01	.00
Z_3			1.00	.00	- .14	- .04	.02	.00
Z_4				1.00	- .04	- .06	.09	.10
Z_5					1.00	.11	- .06	- .03
Z_6						1.00	- .02	.00
Z_7							1.00	- .03
Z_8								1.00

Table 2

Zero-order correlations among the eight variables in the causal model

The path coefficients obtained in the regression analysis are shown in Figure Two. The zero order correlations are shown next to the path coefficients but are enclosed in parentheses. The correlations among the four dimensions of job are indicated as zero and there are, of course, no path coefficients indicated for the relations among these four variables. The relations among the four job dimensions and the proximity value indicate that all effects are direct. This is to be expected since there is no

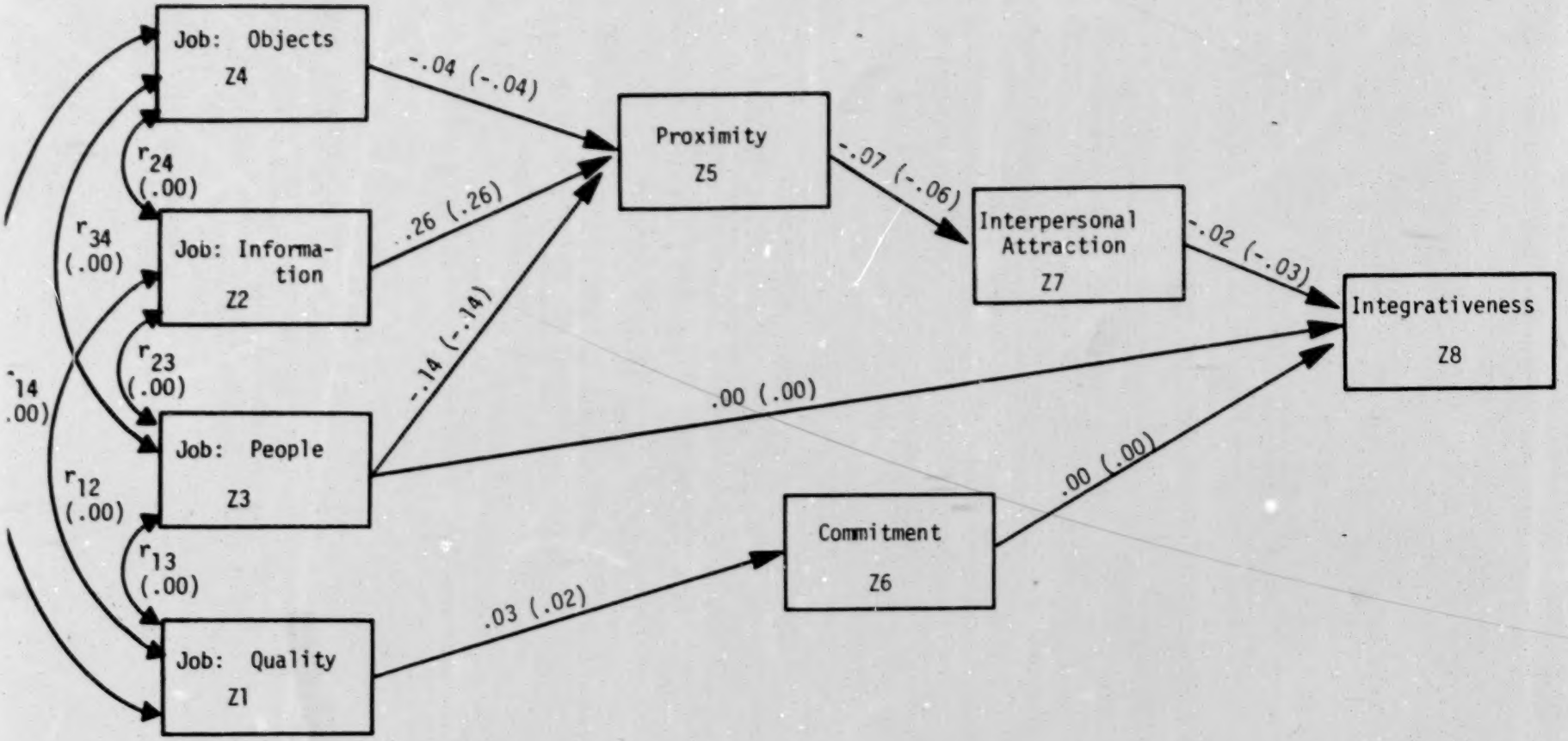

Figure 2.

Path and zero order correlation (in parentheses) coefficients among the variables in the theoretic model

possibility of indirect effects being exerted by orthogonal factor dimensions.

The two most striking aspects of the remainder of the diagram is the extent to which the path coefficients and zero order correlation coefficients are nearly identical, and the extent to which they both approach zero. Since path coefficients measure total direct effects and correlation coefficients measure direct plus indirect effects, the difference between the two indicates the total indirect effects (cf., Kerlinger and Pedhazur, 1973). In all of the paths in the above diagram the path coefficients approximate the zero order correlations; hence, the effects may be assumed to be direct. Furthermore, the fact that both coefficients approximate zero indicates that the relations specified by the theoretic model do not appear to hold in the data as measured.

DISCUSSION

The reason for the absence of support for any of the propositions made in the model is unknown. Given the large and consistent findings of previous research used to generate the model, the present study should not be construed as casting doubt on earlier work. Perhaps the problem lies embedded in the operationalizations of one or more of the variables used in this study or in one of the complex transformations or statistical treatments of the data, though, to date, the authors have been unable to uncover such a problem.

Some post hoc analyses of this model are, of course, possible. Path analysis for a model in which all possible recursive paths are specified can be undertaken. That procedure, however, is not very promising from a theoretical standpoint since it does not permit evaluation of the model. Furthermore, the high number of zero order correlations among all of the variables does not auger well for attempts to test <u>any</u> model with these data.

The analysis reported in this paper is, of course, quite rudimentary. Considerable additional work needs to be undertaken with the present data

set. For example, the commitment variable should be scaled using the other three items to spread the variance over a wider range. Similarly, interpersonal attraction might be measured by more than one scale. The JDI should be used for validating the Job Dimensions Profile and if low validity is indicated, then the dimensions of the JDI should be substituted for those used in the present study; a re-analysis utilizing the JDI scores should prove quite informative. There are also other structural variables which can be studied utilizing the present data, on both the group and individual levels.

In short, the findings of this study shed virtually no light on the complexities governing the formation of communication structure in large organizations. Such knowledge must await subsequent analyses of these data and, hopefully, future research projects.

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